

torial regarding a forecast issued by the Weather Bureau at Washington on June 29:

The Weather Bureau's prediction made on Monday last that there would be a break in the warm wave on Thursday evening came true and was a splendid exhibition of what might be called "long-distance predicting." The sudden change from the almost unbearable heat and humidity that prevailed during the day was most agreeable and invigorating. The heavy shower aided materially in bringing about a more comfortable condition of affairs.

BOSTON FORECAST DISTRICT.*
[New England.]

The month as a whole was warm and dry, and at the close the drought was being severely felt in all sections. There were no high winds or gales on the coast and no storm warnings were issued.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.*
[Louisiana, Texas, Oklahoma, and Arkansas.]

The month was warm and precipitation was deficient over the greater portion of the district. No general storms occurred on the west Gulf coast and no storm warnings were issued.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.*
[Kentucky and Tennessee.]

Temperature averaged about normal, and, except in scattered localities, precipitation was somewhat below normal. The greater portion of the rainfall occurred in the first decade of the month.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.*
[Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, and Montana.]

Temperature conditions were unimportant. Rainfall was above normal practically over the whole district, the excess being the most decided in the middle Missouri Valley. The rains were as a rule successfully forecast. Storm warnings were issued on the morning of the 19th, and the warnings were verified at a majority of the Lake stations. Frost warnings were issued for the lowlands of Michigan and Wisconsin on the 1st, 9th, 10th, 11th, and 14th. Freezing temperature was reported in the cranberry marshes of Wisconsin on four of these dates, and in portions of Michigan on two. The cranberry marshes were flooded, and damage from frost was consequently averted.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.*
[Wyoming, Colorado, Utah, New Mexico, and Arizona.]

The mean temperature was considerably lower than usual, except in south-central Colorado. Precipitation was in excess in the northwestern half and deficient in the southeastern half of the district. In south-central Colorado the long-standing drought was unbroken.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.†
[California and Nevada.]

The month was one of continued cool weather and, until the last week, the usual summer afternoon high temperatures were missing. In Nevada unsettled weather continued until the middle of the month. The only coast disturbance appeared on the 20th. Southwest storm warnings were displayed and verified.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.†
[Oregon, Washington, and Idaho.]

As usual June was a quiet month. Temperature was unusually low in eastern Oregon and southern Idaho. There was a marked excess in rainfall in southern Idaho and a marked deficiency in the Willamette Valley and the Sound country. No wind storms occurred.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

As has been frequently remarked, June is preeminently a month of floods, and those of the present month so far exceeded the majority of their predecessors in extent or duration, or both, that they are entitled to take front rank with the great floods of 1844, 1897, and 1903. They were probably not quite so great when measured by actual water stages as the floods of these former years, but they were equally if not more extensive, and were doubtless greater if measured by their duration and by the amount of losses and damage sustained.

At the end of the month several of the rivers of the Mississippi watershed, including the lower Mississippi, were still in flood. A number of special reports have not been received and it is therefore thought best to postpone for another month the description of these floods. Another report that will also appear at a later date is one on the annual rise of the Columbia River for the year 1908.

The Trinity River of Texas continued in flood thruout its entire length during the month, and it did not fall below flood stage until July 5. The crest of the Brazos River flood reached Booth, Tex., on June 6. A report of this flood covering essential points was included in the MONTHLY WEATHER REVIEW for May, 1908. The crest stages of the Trinity River from Long Lake to the mouth were the highest on record, especially at Long Lake, where the maximum stage of 51.8 feet, 16.8 feet above flood stage, occurred on June 4.

Heavy rains during the first few days of the month over the northern Rocky Mountain districts were followed by destructive floods in all streams of western Montana, eastern Idaho, and northern Wyoming. No river and flood service is maintained on those rivers and detailed reports are therefore not available. The losses and damage, while very large, were of the usual character, with the railroads as the greatest sufferers.

East of the Mississippi River there were no floods during the month, except in some of the smaller streams of New York, where heavy rains about the middle of the month did much damage. The Ohio River was at moderate stages thruout the month.

The highest and lowest water, mean stage, and monthly range at 213 river stations are given in Table IV. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

* Morning forecasts made at district center; night forecasts made at Washington, D. C.

† Morning and night forecasts made at district center.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

A GRADUATE SCHOOL OF METEOROLOGY.

The Association of American Agricultural Colleges and Experiment Stations has adopted one of the wisest plans conceivable for the increase and diffusion of sound knowledge relative to agriculture, i. e., the establishment of a graduate or post-graduate school, in which lectures and experiments by experts and specialists bring home to interested audiences the present

state of our knowledge, the trend of current thought, and the outlook for the future.

The third session of this school was held at Ithaca under the auspices of the New York Agricultural Experiment Station, July 6-31, 1908. The program shows that the instructors and students were kept very busy with their lectures and seminars; the latter are nearly equivalent to the laboratory work of the botanical, physical, and chemical laboratories, in

which the instructor personally guides the student along lines of special investigation. Seven general subjects were treated during this session, i. e., biochemistry, agronomy, horticulture and plant physiology, dairy husbandry and dairying, poultry husbandry, veterinary medicine, entomology. For each of these subjects there were one or two morning hours for lectures and two afternoon hours for seminars. There were, moreover, special Saturday exercises and popular lectures on Wednesday and Friday evenings.

Altho climate, i. e., sunshine and weather, are of vital importance in agriculture, yet we find but little mention of this subject in the program. The nearest approaches to it are the following topics:

- C. G. Elliott: Drainage of land.
- S. Fortier: Irrigation problems.
- L. J. Briggs: Environment; Evaporation; Solar energy.
- L. B. Judson: Effect of acetylene light.
- G. H. Powell: Storage and transportation.
- J. C. Whitten: Phenology.
- J. G. Needham: What shall be done with the marshes?

This omission of the study of climatic conditions is doubtless due to the fact that man can not easily change or experiment with the local climate; he must adapt his methods and plants to the climate, and must achieve success in spite of the current weather.

Possibly climatic influences on crops are not yet sufficiently understood to warrant an attempt to diffuse exact knowledge on this subject. Possibly we have been attaching undue importance to natural climate, i. e., weather and sunshine, as compared with man's modifications of soil and cultivation and the artificial evolution of varieties adapted to the locality.

It is true that during the growing season in any locality there must needs be few frosts, sufficient rain or irrigation water, abundant sunshine and heat. These factors, notwithstanding their large annual variations, are usually so balanced that skilful cultivation and manuring insures a good crop. The work done by man is as essential as that done by nature, so that it is not fair for man to grumble at nature if he fails to raise a good crop.

However, without urging the agriculturist to give climatology a more prominent place in his postgraduate school of agriculture, we must profit by the good example he has set us and, as meteorologists, urge that there be also established a postgraduate school for advanced study in our own important branch of science.

The undergraduate and elementary courses pursued in American colleges and high schools, the various miscellaneous courses of lectures and instruction offered and maintained by the forecasters, section directors, and professors of the Weather Bureau under disadvantageous circumstances, all need to be supplemented by additional facilities. The importance of our subject may be brought into discredit by imperfect presentation.

We believe that there may be as many as fifty or one hundred persons in the United States who would embrace an opportunity to spend a month of strenuous effort in bringing themselves up to a higher standard of knowledge concerning climates and weather. It may be that the Secretary of Agriculture and the Chief of the Weather Bureau have no legal authority to establish such special courses of technical instructions. Congress has imposed on them only the duty of utilizing for the public benefit what little we know of agriculture and meteorology, and they can do little beyond this. But as it is their duty both to make new discoveries, to increase knowledge and to disseminate it among the citizens, therefore they should be allowed to carry on every method that gives promise of accomplishing these desirable results.

Now the "seminar" that forms such a predominating part

of the work of the Graduate School of Agriculture, is more precisely a daily conference between the advanced pupil and the master who is a little way ahead of his pupil. The master undertakes to show the pupil just how important items of our knowledge have been obtained, but the pupils ask many questions, and it is a dull master who does not perceive when his bright pupil is on the road to making some real addition to our knowledge. Not that he will open up a new world to us, but that he may at least settle accurately some point about which our present knowledge is rather hazy. It is thus that step by step they climb the hill of science together. Thus the muses who bear the torches of knowledge light the lamps of the children of men. Thus we learn to see with the eye of the telescope and the microscope, and to feel with the fingers of the scale beam and the standard gage.

How can an annual meeting be arranged covering some weeks of daily lectures and conferences between our older and younger meteorologists, at which each shall give to the other of his store of wisdom and experience? Six hundred Weather Bureau observers and employees, 2,500 cooperative observers, 5,000 teachers, and 100,000 pupils are interested in propositions such as this which contemplates decided advances in meteorology. At present we rely too much on books and letters; we shall do better to get together, ask questions, try experiments, and compare notes.—C. A.

PROGRESSIVE CLIMATIC VARIATIONS ON THE ISTHMIAN OF PANAMA.

By Brig. Gen. HENRY L. ABBOT, U. S. Army, retired, late member, Board of Consulting Engineers. Dated Cambridge, Mass., June 12, 1908.

The study of progressive variations in physical quantities admitting of measurement has largely contributed to the advance of science. For example, that the so-called solar constant of radiation is subject to progressive changes, involving a small temperature fluctuation upon the earth nearly simultaneous with the sun-spot cycle, has been suggested by recent astrophysical researches supplemented by elaborate studies of temperature records at coast and specially at inland stations.

It is well known that the movement of the sun in declination regulates in a marked degree the precipitation upon the Isthmus of Panama, causing annually a normal succession of dry and rainy months as, carrying its rainbelt, it oscillates between the Tropics; and it would seem to be of interest to determine, as well as existing data will permit, whether there are other periodic changes in the Isthmian climate for which perhaps an explanation may be found.

But aside from the purely scientific interests of the question a knowledge of any periodic variations in rainfall, entailing corresponding changes in the volume carried by the Chagres River, is locally important from its bearing on the water supply of the canal, as well as upon the probable conditions attending its construction in the immediate future. That the de Lesseps Company worked under specially unfavorable climatic conditions is an historical fact, and the probabilities for the next few years are well worthy of investigation.

The records available consist of nearly continuous rainfall measurements at Colon made by the Panama Railroad Company from 1863 to 1874, inclusive; those made later at Colon and Gamboa by the two Canal companies and the Liquidation from 1881 to the transfer of the property to the United States in 1904; and those continued to date by the Isthmian Canal Commission. The Colon rainfall records for the years 1875 to 1880, inclusive, are quoted from Plate XXXVIII of Part IV of the Twenty-second Annual Report of the U. S. Geological Survey, the authority not being stated. Closely related to these data are the fluviograph records of water heights at Gamboa which are nearly continuous since 1882. These auto-

¹ Earlier papers on Isthmian rainfall may be found in Monthly Weather Review, February, 1907, XXXV, p. 74, 75.